Bridge weigh-in-motion system and Structural Health Monitoring using fiber optic sensors

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Dr Myra Lydon – Intelligent Infrastructure group

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22nd June 2016

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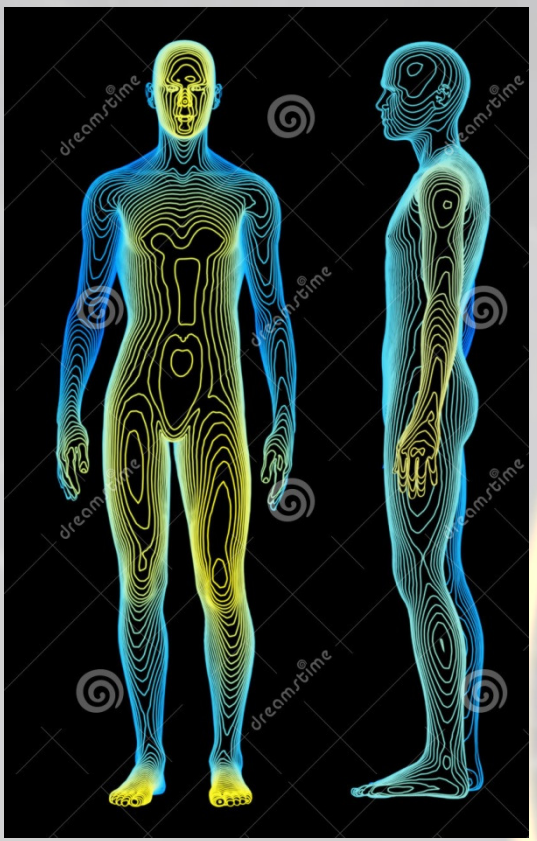
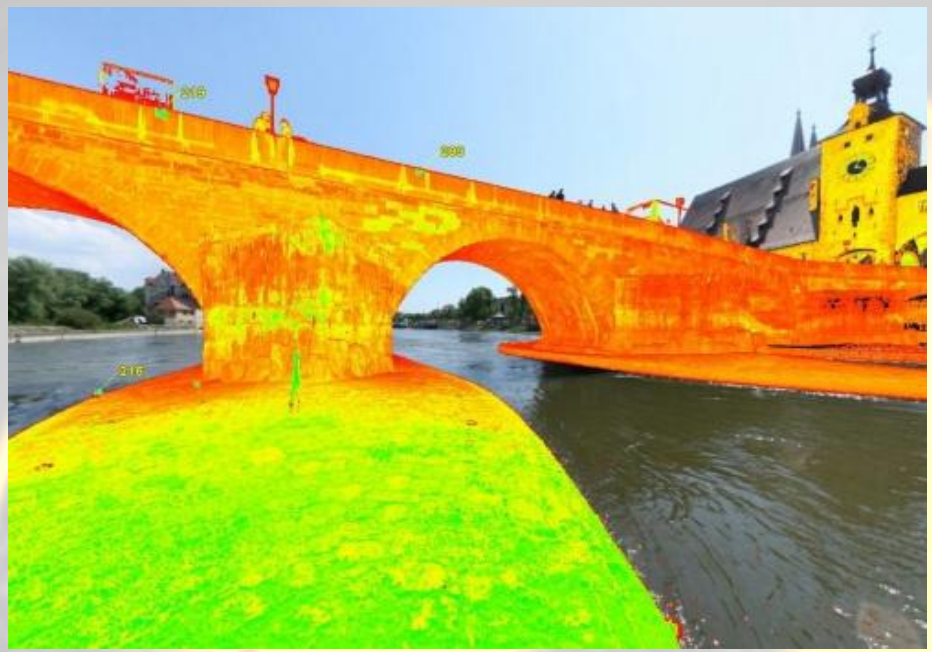
WHAT?

Structural Health Monitoring (SHM)

SHM is a means to enable a structure to generate and communicate information concerning changes in its structural health condition, potential damage and deterioration





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Structural Health Monitoring (SHM)

Detect
Recognise
Localise
Quantify

Pain

Exam and Diagnosis

Cure

Or

Detect
Inform

Defect

Inspect

Diagnosis

Repair

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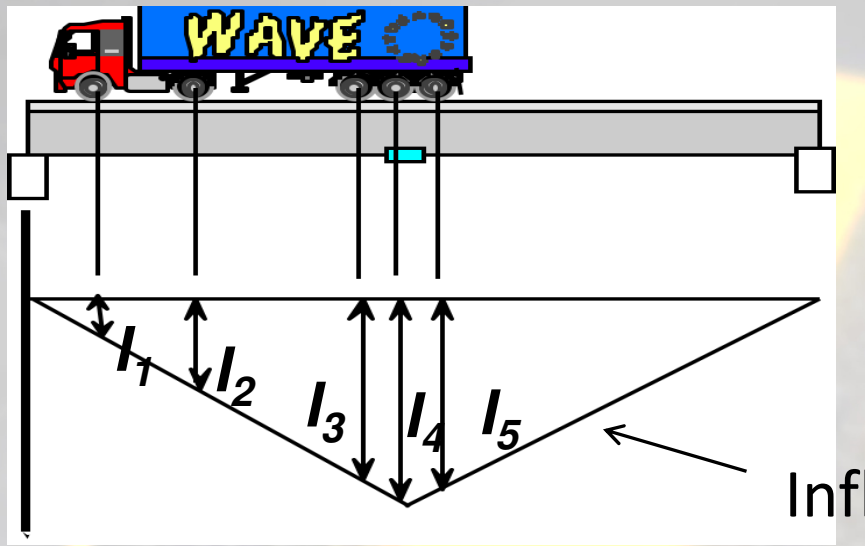
Bridge Weigh-in-Motion (B-WIM)

Bridge WIM Concept:



Influence line

$$M_A^{th} = W_1 \times I_1 + W_2 \times I_2 + \ldots..$$

WHY?

Increased loading:

- A large amount of the bridges across the world are reaching the end of their design lives
- the intensity and type of loading induced is very different from those anticipated at design stage
- There is a requirement to retain infrastructure for longer and enhance its capacity

Structural Challenges:

- Materials have inbuilt imperfections/flaws
- Degradation and wear from corrosion, fatigue or systemic overloading

Structural Challenges:

- Some older structures were not designed for modern demands
- Changes in the environment impose higher loads such as wind loads
- Extreme events such as impact damage , flooding or vandalism

Our Solution

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Bridge site Loughbrickland, Co. Down:

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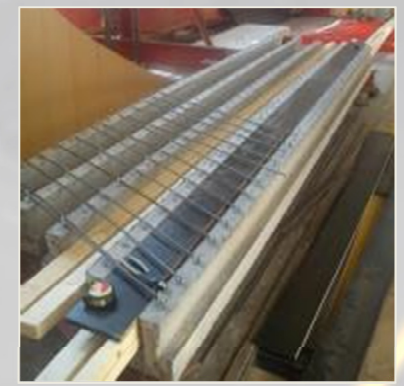
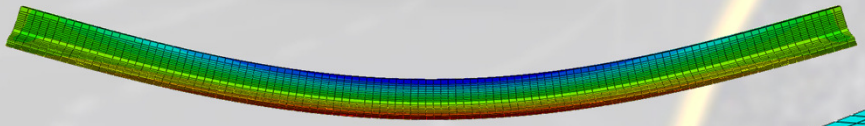
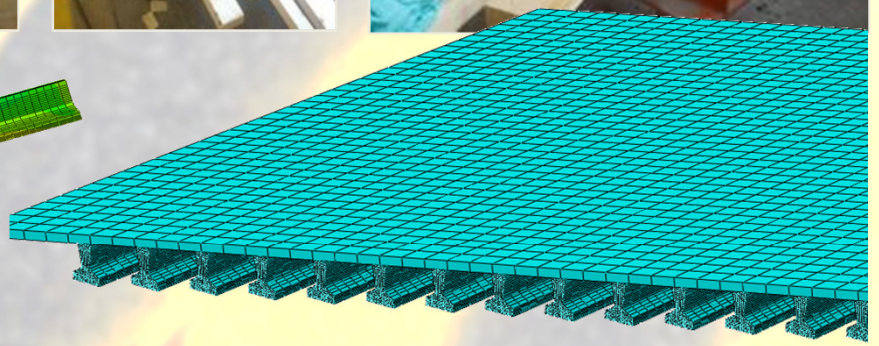
B-WIM System development

- Lab trials and Finite Element modelling carried out to determine critical sensor locations and predict bridge behaviour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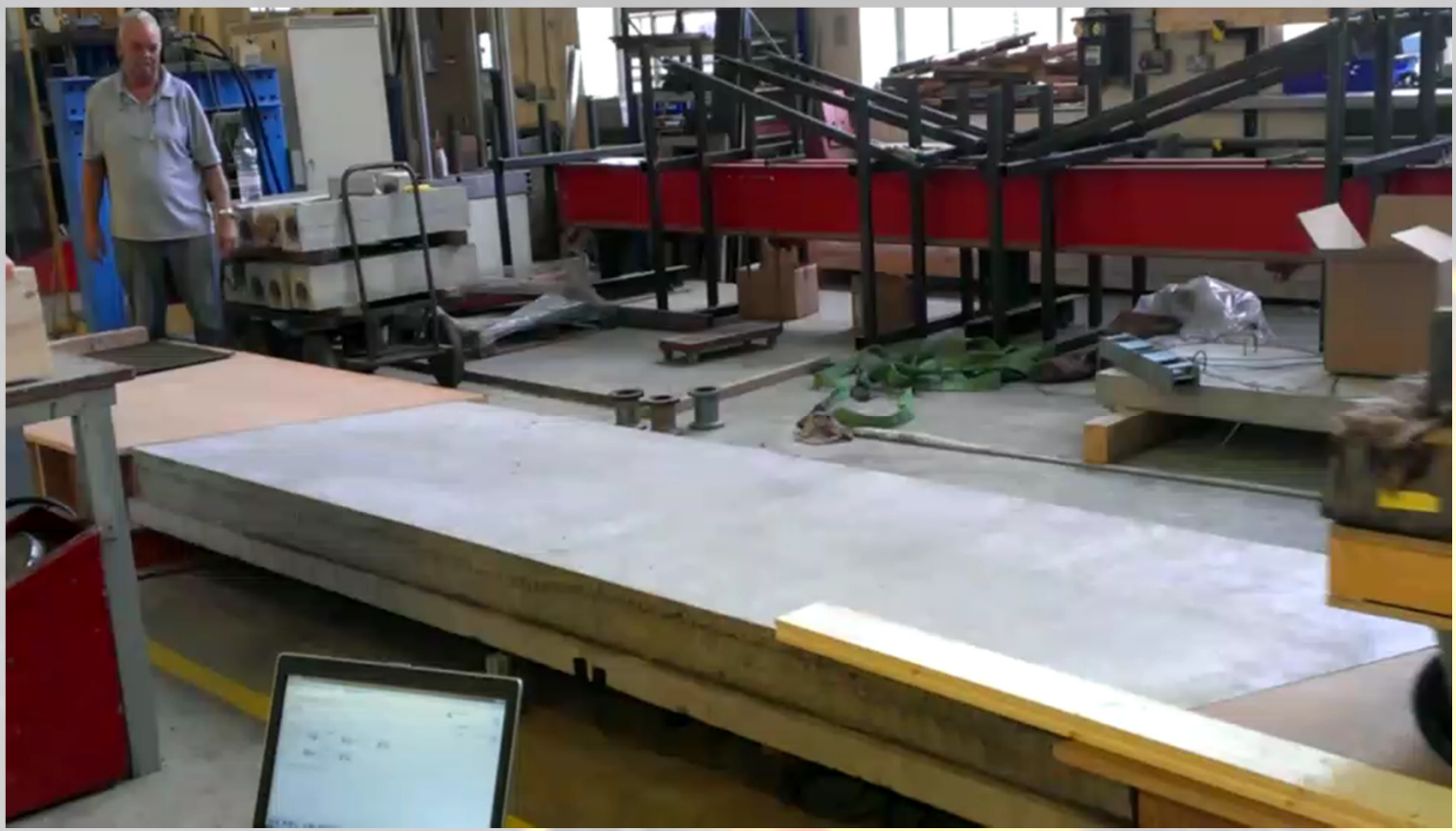
B-WIM System development



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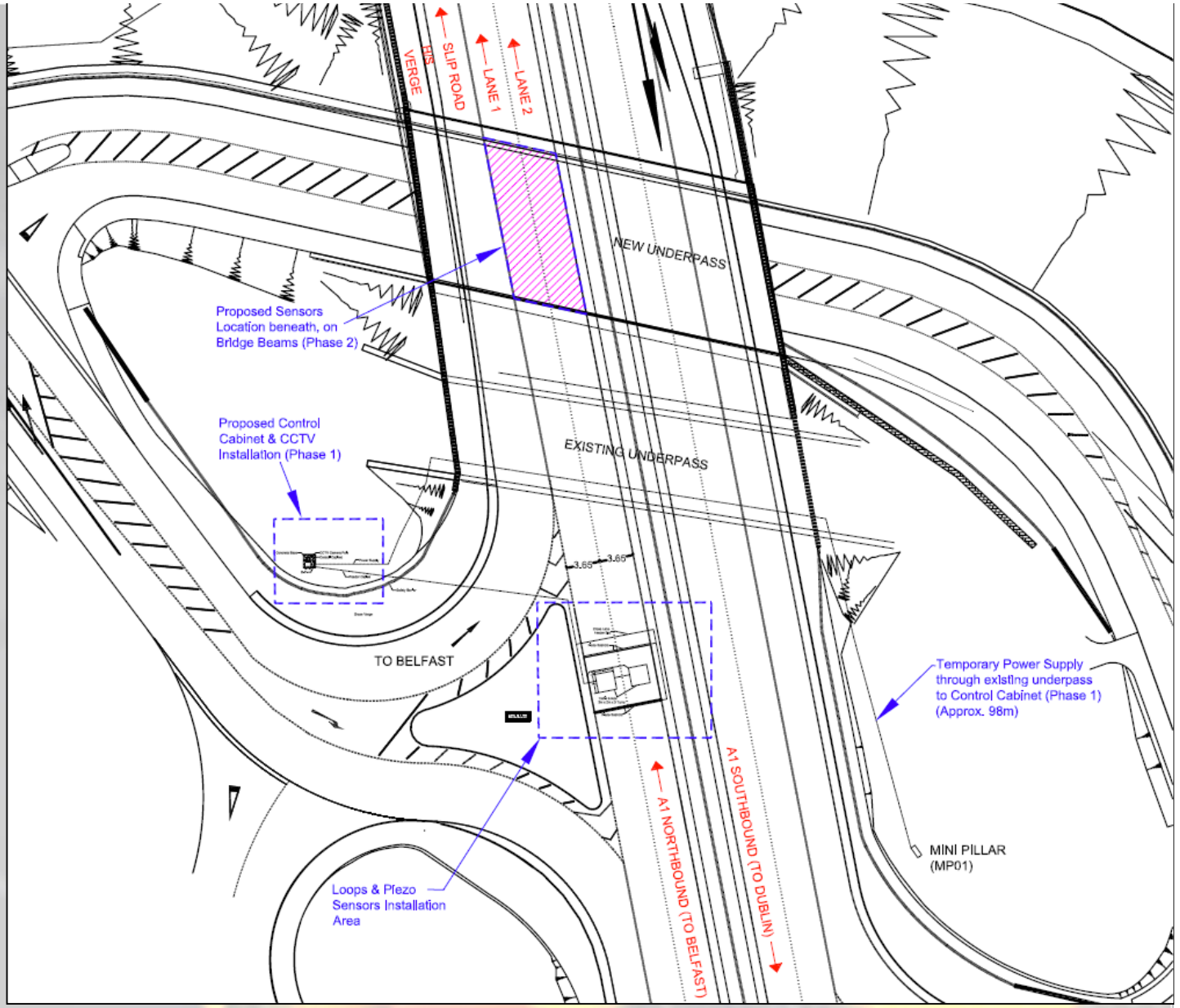
B-WIM Installation layout



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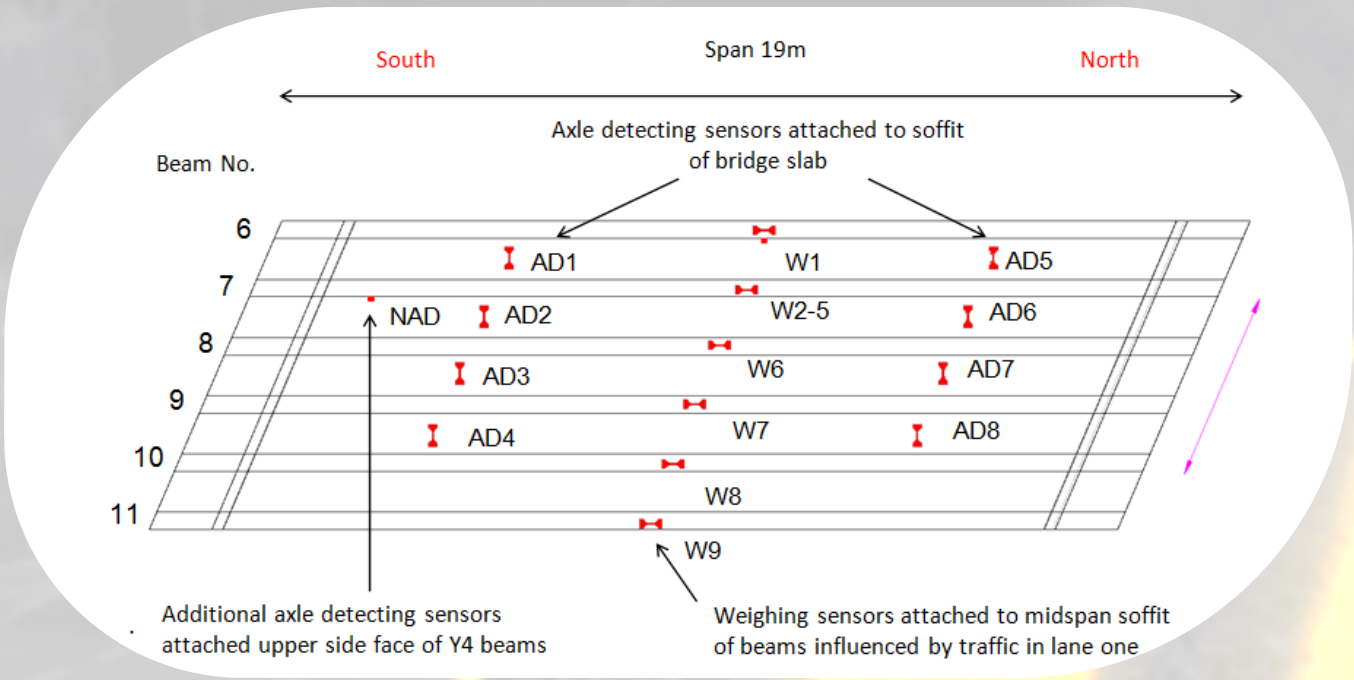
B-WIM Installation



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B-WIM Calibration

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B(10) GVW

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Successful new method of axle detection

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